**Documentation for Assignment 03-04**

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**Problem statement:**

Jane is the administrator of an apartment building and she wants to manage the monthly expenses for each apartment. Jane needs an application to store, for a given month, the expenses for each apartment. Each expense is stored in the application using the following elements: apartment (number of apartment, positive integer), amount (positive integer), type (from one of the predefined categories: water, heating, electricity, gas, other). Help Jane by creating an application that provides the following functionalities.

**Feature list:**

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| Feature |
| F1. *Add* a new transaction to the list |
| F2. *Remove* an apartment, an interval of apartments or all the expenses for a type for all apartments |
| F3. *Replace* the amount of the expense with a type for an apartment with another amount |
| F4. *List* the expenses having different properties |
| F5. Obtain different characteristics of the expenses, such as sum, max, and sort |
| F6. *Filter* the data by type or value |
| F7. *Undo* the last operation that modified program data |

**Syntax for operations:**

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| **add** <apartment> <type> <amount>, … |
| **remove** <apartment>, … |
| **remove** <start\_apartment> to <end\_apartment> |
| **remove** <type> |
| **replace** <apartment> <type> with <amount> |
| **list** |
| **list** <apartment> |
| **list** [ < / = / >] <amount> |
| **sum** <type> |
| **max** <apartment> |
| **sort apartment** |
| **sort type** |
| **filter** <type> |
| **filter** <amount> |
| **undo** |
| **exit** (if you want to exit the application) |

**Running Scenario:**

|  |  |  |
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| **USER** | **PROGRAM** | **DESCRIPTION** |
|  | 1 gas 10  1 water 30  1 tv 20  2 gas 30  2 electricity 10  3 gas 10  3 water 20  3 internet 80  4 gas 50  4 electricity 20 | Print the menu and the list with predefined apartments |
| add 5 gas 10, 5 water 20 |  | Add to the list some expenses for apartment 5 |
|  | 1 gas 10  1 water 30  1 tv 20  2 gas 30  2 electricity 10  3 gas 10  3 water 20  3 internet 80  4 gas 50  4 electricity 20  5 gas 10  5 water 20 | Add to the list expenses for apartment 5 |
| remove 2, 3 |  | Removes the expenses for apartments 2 and 3 |
|  | 1 gas 10  1 water 30  1 tv 20  4 gas 50  4 electricity 20  5 gas 10  5 water 20 | Now, expenses for apartments 2 and 3 are removed |
| add 6 gas 20, 7 electricity 20 |  | Add new expenses for apartments 6 and 7 |
|  | 1 gas 10  1 water 30  1 tv 20  4 gas 50  4 electricity 20  5 gas 10  5 water 20  6 gas 20  7 electricity 20 | The expenses for apartments 6 and 7 are added |
| replace 6 gas with 10 |  | Replaces the amount for apartment 6, type gas with 10 |
|  | 1 gas 10  1 water 30  1 tv 20  4 gas 50  4 electricity 20  5 gas 10  5 water 20  6 gas 10  7 electricity 20 | The value for apartment 6, type gas is replaced with 10 |
| remove 4 to 6 |  | The expenses for apartments 4, 5 and 6 will be removed |
|  | 1 gas 10  1 water 30  1 tv 20  7 electricity 20 | The expenses for apartments 4, 5 and 6 are removed |
| remove gas |  | All the expenses with type gas will be removed |
|  | 1 water 30  1 tv 20  7 electricity 20 | The expenses with type gas are removed |
| undo |  | Undo the last operation that modified the list |
|  | 1 gas 10  1 water 30  1 tv 20  7 electricity 20 | Undo the last operation that modified the list |
| undo |  | Undo the last operation that modified the list |
|  | 1 gas 10  1 water 30  1 tv 20  4 gas 50  4 electricity 20  5 gas 10  5 water 20  6 gas 10  7 electricity 20 | Undo the last operation that modified the list |
| sum water |  | Calculate the sum of all expenses of type water |
|  | The total amount for the expenses having type water is 50 | Print the sum of all expenses of type water |
| max 1 |  | Calculate the maximum expense for apartment 1 |
|  | The maximum amount per each expense type for apartment 1 is 30 for water | Print the maximum expense for apartment 1 |
| sort apartment |  | Sorts the apartments ascending by total amount of expenses |
|  | The apartments sorted ascending by total amount of expenses:  6 with 10 RON  7 with 20 RON  5 with 30 RON  1 with 60 RON  4 with 70 RON | Prints the apartments ascending by total amount of expenses |
| sort type |  | Sort the types of expenses ascending by total amount of expenses per each type |
|  | The total amount of expenses for each type, sorted ascending by amount of money:  tv with 20 RON  electricity with 30 RON  water with 50 RON  gas with 80 RON | Print the types of expenses ascending by total amount of expenses per each type |
| filter gas |  | Keeps for each apartment only the expenses for type gas |
|  | 1 gas 10  4 gas 50  5 gas 10  6 gas 10 | Keeps for each apartment only the expenses for type gas |
| filter 40 |  | Keeps for each apartment only the expenses lower than 40 RON |
|  | 1 gas 10  5 gas 10  6 gas 10 | Keeps for each apartment only the expenses lower than 40 RON |
| undo |  | Undo the last operation that modified the list |
|  | 1 gas 10  4 gas 50  5 gas 10  6 gas 10 | Undo the last operation that modified the list |
| undo |  | Undo the last operation that modified the list |
|  | 1 gas 10  1 water 30  1 tv 20  4 gas 50  4 electricity 20  5 gas 10  5 water 20  6 gas 10  7 electricity 20 | Undo the last operation that modified the list |
| list |  | Print the entire list |
|  | 1 gas 10  1 water 30  1 tv 20  4 gas 50  4 electricity 20  5 gas 10  5 water 20  6 gas 10  7 electricity 20 | Print the entire list |
| list 1 |  | Print the expenses for apartment 1 |
|  | The current expenses for apartment 1 are:  gas 10  water 30  tv 20 | Print the expenses for apartment 1 |
| list < 50 |  | Print the apartments having total amount of expenses smaller than 50, or a message if there is no such apartment |
|  | The apartments having total current expenses < 50RON are:  5  6  7 | Print the apartments having total amount of expenses smaller than 50, or a message if there is no such apartment |
| list > 50 |  |  |
|  | The apartments having total current expenses > 50RON are:  1  4 | Print the apartments having total amount of expenses bigger than 50, or a message if there is no such apartment |
| list = 50 |  | Print the apartments having total amount of expenses 50 RON, or a message if there is no such apartment |
|  | There are no apartments having total current expenses = 50RON. | Print the apartments having total amount of expenses 50 RON, or a message if there is no such apartment |
| exit |  | Exit the program |
|  | exit | Exit the program |

**Tasks:**

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| 1. Create an apartment |
| 1. Calculate total expenses for an apartment |
| 1. Calculate total expenses for a type |
| 1. Search an expense by apartment\_id and type |
| 1. Search an expense only by type |
| 1. Sort a list of pairs ascending by the second element of the pair |
| 1. Implement operations (add, remove, replace, filter, undo, etc) |
| 1. Implement user interface |